PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF
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Recent Cell Studies of J. Arnold.—The more recent studies of J. ARNOLD (*Archiv f. mikrosk. Anat.*, 1900, Band lv., p. 479–488, and *Anat. Anz.*, Band xvii., p. 517–519) turn chiefly upon the so-called *Granulalehre*, a theory of certain cytoplasmic granules. With a special technique Arnold has investigated certain general problems, such as the origin (pre-existence or importation) of the granules, their relation to phagocytosis, their value as an index or property of the cell's life. The technique is in general simple enough and the materials few; tongue, web, mesentery, subcutis, and dorsal lymph sac of the frog; warm stage, elder pith for inclusions; stains—especially methylene blue and *Neutralroth*, and a variety of inert substances—oils, iron, and the like—for injection.

A good idea of his work may be obtained from an earlier article, "Ueber Granulafärbung lebender und überlebender Leukocyten," *Virchow's Archiv*, Band clvii., S. 424. The tissues are examined alive and at various time-intervals. The effects are shown of using the stains in powder or solution, of injecting substances *intravitam* or applying them to excised tissues.

The granules apparently pre-exist as granules or as hyaline droplets. The demonstration of the granules is possible both before and after the phagocytosis of indifferent bodies, such as fat granules. The granules Arnold takes to be essential structural elements of the cells—true plasmasomes—and their staining he looks upon as a vital property. Take, for illustration, a recent experiment: Upon a frog's tongue, held in the Thoma apparatus, dust methylene blue in finely granular state; drop on 1 per cent. NaCl, cover, and watch under a microscope. In from fifteen to twenty minutes certain cells in the middle of the so-called nerve papilla assume a blue-gray color, due to fine granules of the stain as yet laid only on cell surfaces. Later, an intense fine granulation appears in the subepithelial tissue, which is gradually made out to stand in connection with fine varicose fibres. Fibres are given off which end in a small swelling below the surface. The fibres remain stained several hours.

Certain curious and unpredictable results are obtained. For instance, in the above process cells occur at the periphery of the papilla which assume the stain early. These, it may be supposed, are peculiar or perhaps moribund cells. But Arnold is as yet uncertain whether diffuse staining of either nucleus or cytoplasm means in all cases cell-death. Again, the number of granules demonstrable by methylene blue is, as a rule, smaller than by *Neutralroth*, although the number of granules demonstrable in mast-cells is larger by methylene blue.

In the mesentery the stains occur especially near the lymph paths, of which the cells have granules in their processes.

It is hard to appraise these studies which Arnold has made. Little appears to have been done by others either in confirmation or in extension of this work.

An earlier study by Arnold ("Ueber die Structur und Architectur der Zellen," *Archiv f. mikrosk. Anat.*, Band. lii., S. 134) may be interpreted as an attempt to get the solid tissues into a state wherein blood-technique may be applied to them. By maceration in Lugol's solution Arnold was enabled to isolate the most varied cells (including nerve and smooth muscle cells) and to examine them in smears. The later work takes its departure logically from the desire to obtain for the solid tissues a second advantage usually conceded to blood work—the observation, namely, of the cells alive and in process of assuming stains; hence proceeds the stress now laid upon the "vital" nature of the granule staining. It is very easy to see, therefore, that many of Arnold's articles are hard to understand by themselves, and must be thought of as ancillary to the main problem—the cytology of the solid tissues of vertebrates.—E. E. S.

Structure and Histogenesis of Neuroglia Tissue under Pathological Conditions.—BONOME (*Virchow's Archiv*, 1901, vol. clxiii., p. 441) notes the dearth of recent work on pathological glia, and reports his own series of some twelve cases (including, besides gliomata, some glioses). Bonome attacks the problem after the fashion of the histologists. He wishes to do for pathological glia what has been done for normal glia, and so uses almost exclusively Weigert's differential methods. The plates recall those of Weigert's 1895 monograph.

The paper is divided into a number of sections, comprising the cytology of glioma, the distinctions between glioma and gliosis, the significance of epithelial elements in glioma, and the interrelations of cell and fibril in glia new-formation.

Gliomata are true tumors characterized by cellular richness (suggesting endothelial sarcomata), by exceeding vascularity, by tendency to necrobiosis with cavity formation, and by the absence of included nerve fibres or ganglion cells. Histologically, the cells of gliomata possess more or less embryonic characters, and resemble in turn sarcoma cells (proliferative activity marked) and ectodermic elements (proliferative activity less marked). Fibrillæ are rarely so numerous as in either normal glia or simple gliosis. In simple gliosis the fibrillæ are so numerous as to remind one of a fibrin network. The cells in gliosis are less numerous and less atypical than in glioma, for in glioma the cells seem never to have reached the embryonic stage in which epithelial and spongioblast forms have become differentiated; the cells are larger, the nuclei are more vaguely outlined, the picture is in every way more "peculiar" than in gliosis. The paucity of fibrillæ demonstrable in gliomata Bonome compares with a similar lack in three to five months' embryos treated by the same method.

Of interest on the genetic side is the finding of epithelial elements in gliomata (either lining cystic cavities or in groups or cords in a field of glia cells). Such are to be considered, according to Bonome, not as developmental errors or insignificant inclosures, but rather as instances of genuine preservation of the embryonic type, and, in particular, of the wandering tendency which characterizes those earliest cells. To explain such heterotopia of glia cells alone one may suppose no neuroblast elements were present in the original foci, or perhaps that the differential capacity of such cells is lost and that the wandering derivations are fated at least to lie as inactive elements within the tumor—neither true glia cells nor true nerve cells. Certain cases are adduced, notably one of Stroebe's, to give color to the belief that the occurrence of epithelium in gliomata is not secondary and that, whether or no the cavities occur as lateral branchings of the central canal or in truly independent foci, the deposit of glia is secondary, that of epithelium primary.

Bonome's conclusions upon fibrils are as follows: The fibrils are chemically different from the cell-protoplasm, nor are any transitions observable in staining reaction according to the vicinity or remoteness of the fibril from the cell. The system of glia fibrils, it is a triumph of modern technique to have shown, is an intercellular (not cytoplasmic) substance. But the fibrils are probably derivatives of the cytoplasm, not sproutings from it, but chemical deposits incident to a certain stage in the cytoplasm's development. In general the earlier one catches either normal or pathological glia the fewer fibrils; glia cells of the embryonic type do not produce fibrils (how easy then to confuse tumors of such type with sarcoma!). The oldest part of a glioma will be doubtless that which contains most fibrils.

From the necessary combination of such an array of factors is easily explained the frequent absence or paucity of glia and fibrils in the neighborhood of foreign bodies, tubercles, and the like. Return to embryonic condition, over and above some stimulus, is required to yield new glia. As for fibrils, the proper stage in the cytoplasmic development may not have been reached. If new fibrils are developed out of proportion to cells present one must consider that the cytoplasm may contribute merely the differentiating element in their evolution, or perhaps the cells, exhausted in the production of fibrils, may be earlier destroyed.

In certain cases glia acts precisely like connective tissue (though always chemically to be distinguished). A plate is given to show penetration of pia by new-formed glia. Glia fibrils are distinguished from fibrin-threads not alone by failure to branch, but also by being subject swiftly to cadaveric change (granulation). [E. E. S.]

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